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10/765,737	01/27/2004	Carl A. Reiser	C-3363	1103

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EXAMINER	
ONEILL, KARIE AMBER	

ART UNIT	PAPER NUMBER
1795	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/765,737	REISER, CARL A.	
	Examiner	Art Unit	
	Karie O'Neill	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _22 February 2008_.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _1-5_ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _1-5_ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on _27 January 2004_ is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. The Applicant's amendment filed on February 22, 2008, was received. None of the claims have been amended. Therefore, Claims 1-5 are pending in this office action.

2. The text of those sections of Title 35, U.S.C. code not included in this action can be found in the prior Office Action issued on December 20, 2007.

3. The Declaration under 37 C.F.R. 1.132, submitted February 22, 2008, has been acknowledged and considered.

Claim Rejections - 35 USC § 102

4. The rejection of Claims 1-2 and 4-5 under 35 U.S.C. 102(e) as being anticipated by de Vaal et al. (US 6,815,101 B2) is maintained. The rejection is repeated below for convenience.

With regard to Claims 1 and 4, de Vaal et al. discloses a method comprising: providing a fuel reactant gas to fuel reactant gas flow fields of the fuel cell power plant (column 7, lines 22-26). The reference discloses purging at least a small amount of partially depleted fuel reactant gas exiting from said flow fields (column 8, lines 22-39) and sensing the direction of flow of gas between said flow fields and ambient (column 9, lines 9-15). The sensing takes place when the hydrogen concentration sensor monitors the hydrogen concentration level in the ambient atmosphere surrounding the fuel cell stack, to determine that the direction of flow of fuel is from the flow fields to the ambient (column 9, lines 9-15). De Vaal et al. also discloses disconnecting the electrical load

from the fuel cell stack in response to a low gas concentration in the ambient atmosphere (column 14, lines 48-51). The phrase "low gas flow" encompasses the claimed limitation "no gas flow".

The phrase "of reducing performance degradation due to hydrogen starvation of a fuel cell power plant providing electrical power to a load" is considered intended use. A claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. See MPEP 2113. Therefore, the intended use limitation has been considered, but is given no patentable weight.

With regard to Claims 2 and 5, de Vaal et al. discloses an apparatus comprising: a fuel cell power plant having fuel reactant gas flow fields (column 7, lines 22-26) and a means for providing fuel reactant gas to said flow fields through a fuel system including a source of fuel such as one or more fuel tanks and a fuel regulating system for controlling delivery of the fuel (column 7, lines 24-26). De Vaal et al. discloses a means for purging at least a small amount of partially depleted fuel reactant gas through a fuel purge valve (column 8, line 18) and a means for sensing the direction of flow of gas between said flow fields and ambient through a purge cell voltage sensor which detects a performance drop below a threshold level and sends a signal to a purge valve controller to open the purge valve and discharge the impurities into ambient, the ambient environment being monitored and controlled by other systems (column 8, lines 22-38). De Vaal et al. also discloses a means for disconnecting the electrical load from

the fuel cell stack by opening a circuit relay with the power circuit relay controller (column 14, lines 48-67).

The phrase "for reducing performance degradation due to hydrogen starvation of a fuel cell power plant providing electrical power to a load" is considered intended use. A claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. See MPEP 2113. Therefore, the intended use limitation has been considered, but is given no patentable weight.

Claim Rejections - 35 USC § 103

5. The rejection of Claims 1 and 4 under 35 U.S.C. 103(a) as being unpatentable over de Vaal et al. (US 6,815,101 B2) are maintained. The rejection is repeated below for convenience.

With regard to Claims 1 and 4, de Vaal et al. discloses a method comprising: providing a fuel reactant gas to fuel reactant gas flow fields of the fuel cell power plant (column 7, lines 22-26). The reference discloses purging at least a small amount of partially depleted fuel reactant gas exiting from said flow fields (column 8, lines 22-39) and sensing the direction of flow of gas between said flow fields and ambient (column 9, lines 9-15). The sensing takes place when the hydrogen concentration sensor monitors the hydrogen concentration level in the ambient atmosphere surrounding the fuel cell stack, to determine that the direction of flow of fuel is from the flow fields to the ambient

(column 9, lines 9-15). De Vaal et al. also discloses disconnecting the electrical load from the fuel cell stack in response to a low gas concentration in the ambient atmosphere (column 14, lines 48-51). De Vaal et al. does not disclose disconnecting the electrical load from the fuel cell in the event that there is no flow of gas from the flow fields toward ambient. It would have been obvious to one of ordinary skill in the art to disconnect the electrical load from the fuel cell when no gas flow is sensed so as not to damage the fuel cell due to lack of necessary gases and/or damage the load by continuing operation under conditions in which the fuel cell is not providing an uninterruptible power supply for the load.

The phrase "of reducing performance degradation due to hydrogen starvation of a fuel cell power plant providing electrical power to a load" is considered intended use. A claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. See MPEP 2113. Therefore, the intended use limitation has been considered, but is given no patentable weight.

6. The rejection of Claim 3 under 35 U.S.C. 103(a) as being unpatentable over de Vaal et al. (US 6,815,101 B2), as applied to Claim 2 above, and in further view of Gast (US Pub. No. 2005/0161520) is maintained. The rejection is repeated below for convenience.

De Vaal et al. discloses the apparatus in paragraph 4 above, but does not disclose wherein said means for sensing the direction of flow comprises a flap disposed within the flow of gas which will operate a switch when the flow of gas is toward ambient.

Gast discloses the use of simple flow sensors, such as those which are flow-actuated flaps or plates held in a preferred position, and send a signal as a function of their position (paragraph 0073). Therefore, at the time of the invention, it would have been obvious to one of ordinary skill in the art to use a flap actuated sensor with the apparatus of de Vaal et al., because Gant teaches the flap actuated sensor enabling the circulation of circulating systems to be monitored and/or subject to close-loop and/or open-loop control as a function of power, flow and/or volumetric through-flow (paragraph 0074).

Response to Arguments

7. Applicant's arguments filed February 22, 2008, have been fully considered but they are not persuasive.

Applicant states, "Claims 1, 2, 4 and 5 are rejected as anticipated by de Vaal et al. The last element of each of these claims recites "disconnecting the electrical load from the fuel cell stack in the event that there is no flow of gas from said flow fields towards ambient." At the bottom of page 5 of the office action dated December 20, 2007, it is stated that "de Vaal does not disclose disconnecting the electrical load from the fuel cell in the event that there is no flow of gas from the flow fields towards

ambient." For that reason alone, the rejection of claims 1, 2, 4 and 5 must be withdrawn."

In response to the arguments, the Claim language of Claims 1, 2, 4 and 5 reads disconnecting the load from the fuel cell stack "in the event that there is no gas flow". A first rejection of Claims 1, 2, 4 and 5 under 35 U.S.C. 102(e), by de Vaal et al., is made because the method describes a process wherein a step occurs in response to other conditions; i.e., gas flow. If the condition is not met, then the claim does not require the method step. The examiner is to give claims their broadest reasonable interpretation in light of the supporting disclosure. See MPEP 2106. Further, this rejection states that deVaal discloses "disconnecting the electrical load from the fuel cell stack in response to a <u>low gas concentration</u> in the ambient atmosphere" (column 14, lines 48-51). The phrase "low gas flow" encompasses the claimed limitation "no gas flow" because no gas flow is the lowest amount. Therefore, a proper 102(e) rejection has been established. A second rejection of Claims 1 and 4, under 35 U.S.C. 103(a), also by deVaal et al., is made in the situation of <u>no gas flow</u>. For that reason, the 103(a) rejection is also proper for these claims.

Applicant asserts that in deVaal, "there is not a single instance referring to "flow of gas between said flow fields and ambient". Nor is there any reference to "flow of hydrogen". The allegation that the direction of flow of gas between the flow fields and ambient occurs by monitoring hydrogen concentration in the ambient is certainly not supported at column 9, lines 9-15 of the reference. This is an incorrect statement, unsupported by the facts, and clearly opposite to the teachings of deVaal."

This argument is not persuasive. Not only does deVaal et al. disclose that there is a flow of gas between said flow fields and ambient, but it is also an inherent practice of a typical fuel cell. For instance, deVaal et al. teaches that each fuel cell assembly 16 includes a membrane electrode assembly 20 including two electrodes, the anode 22 and the cathode 24, separated by an ion exchange membrane 26. The fuel cell assembly 16 also includes a pair of separators or flow field plates 28 sandwiching membrane electrode assembly 20. Each of the flow field plates 28 includes one or more reactant channels 30 formed on a planar surface of flow field plate 28 adjacent an associated one of the electrodes 22, 24 for carrying fuel to anode 22 and oxidant to cathode 24, respectively. Fuel stack 12 is designed to operate in a dead-ended fuel mode, thus substantially all of the hydrogen fuel supplied to it during operation is consumed, and little if any hydrogen is carried away from stack 12 in normal operation of system 10. However, embodiments of the fuel cell can also be applicable to fuel cell systems operating on dilute fuels which are not dead-ended (column 5, lines 3-29). The fuel cell stack also includes a fuel steam inlet port and a <u>fuel stream outlet port 35 for discharging an exhaust fuel stream from the fuel cell stack</u> that comprises primarily water and non-reactive components and impurities, such as any introduced in the supply fuel stream or entering the fuel stream in stack 12. Fuel stream outlet port 35 is normally closed with a valve in dead-ended operation. Although fuel cell stack 12 is designed to consume substantially all of the hydrogen fuel supplied to it during operation, traces of un-reacted hydrogen may also be <u>discharged through the fuel stream outlet port 35 during a purge of fuel cell stack 12</u>, affected by temporarily

opening a valve at fuel stream outlet port 35 (column 5, lines 55-67). Therefore, while the phrase "flow of gas between flow fields and ambient" may not be specifically used, the process of fuel flowing through the flow fields in the fuel cell stack to ambient is disclosed by deVaal et al.

In another instance, Applicant asserts that there is not a single instance of referring to "flow of gas between said flow fields and ambient".

This argument is not persuasive and has been addressed. Again, deVaal et al. describes gas flow from the inlet through the fuel cell to produce electricity and to ambient where concentrations of reactants are monitored to determine the control of operation of the fuel cell (column 14, lines 48-67).

Applicant asserts in the Declaration that the monitoring of hydrogen does not relate to operation of the fuel cell, but merely to avoid explosion. The Declaration goes on to say that the operation of deVaal is opposite to the claimed subject matter since deVaal seeks to avoid excess hydrogen whereas the claims relate to avoiding a dearth of hydrogen. The Declaration also states that deVaal does not monitor hydrogen alone, but only in an environment including cooling air and gas from leaks.

The Declaration has been considered, but is not persuasive. The use of the fuel cell system of deVaal is not relevant to the rejection because the system of deVaal teaches all of the claimed elements as noted.

In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., monitoring hydrogen concentration to avoid explosion; not monitoring hydrogen

alone) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See MPEP 2145.

Applicant asserts that deVaal teaches away from the subject matter claimed herein, since it is taught that monitoring of oxygen concentration may be used as a backup for monitoring hydrogen. That is, that oxygen monitoring may be done as well instead of hydrogen monitoring.

deVaal et al. does not teach away from the subject matter claimed. As stated above, deVaal et al. discloses providing a hydrogen fuel to reactant flow field channels of the fuel cell stack and purging impurities and traces of un-reacted hydrogen (column 5, lines 5-67). The invention teaches monitoring the flow of hydrogen from the fuel cell using sensors.

Applicant asserts in the Declaration that deVaal does not disclose monitoring any flow whatsoever, therefore not the flow from the fuel flow fields. Applicant also asserts that deVaal does not disclose monitoring, in any fashion, hydrogen that is unadulterated by air.

deVaal et al. discloses in column 8 lines 18-37, the fuel cell stack 12 includes a fuel purge valve 70 provided at a fuel stream outlet port 35 of the fuel cell stack 12. Because of the cascaded flow design, any impurities (e.g., nitrogen) in the supply fuel stream tend to accumulate in purge cell portion 36 during operation. A build-up of impurities in purge cell portion 36 tends to reduce the performance of purge cell portion 36. The venting of hydrogen by the purge valve 70 during a purge is preferably limited

(e.g., to less than 1 liter/minute on a continuous basis) ("average hydrogen discharge rate") to prevent the ambient environment monitoring and control systems from triggering a failure or fault. By measuring the hydrogen content, flow from the fuel cell is sensed. In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., not monitoring hydrogen unadulterated by air) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See MPEP 2145.

Applicant asserts that deVaal therefore does not disclose the subject matter in the penultimate element of claims 1, 2, 4 and 5: "sensing the direction of flow of gas between said flow fields and ambient".

deVaal et al. discloses electronic fuel cell monitoring and control system 14 comprises various electrical and electronic components on a circuit board 38 and various sensors 44 and actuators 46 distributed throughout fuel cell system 10. Fuel cell system 10 provides fuel (e.g., hydrogen) to anode 22 by way of a fuel system 50. Fuel system 50 includes a source of fuel such as one or more fuel tanks 52, and a fuel regulating system 54 for controlling delivery of the fuel. Fuel system 50 includes a hydrogen concentration sensor S5 and a hydrogen sensor check sensor S11. Additional controllers such as a hydride valve solenoid CS7 controls flow through the fuel tank valves 56. A hydrogen regulator 68 regulates the flow of hydrogen from fuel tanks 52. Fuel is delivered to the anodes 22 of the fuel cell assemblies 16 through a hydrogen inlet conduit 69 that is connected to fuel stream inlet port of stack 12. A fuel

purge valve 70 is provided at fuel stream outlet port 35 of fuel cell stack 12 and is typically in a closed position when stack 12 is operating. A build-up of impurities in purge cell portion 36 tends to reduce the performance of purge cell portion 36; should the purge cell voltage sensor S4 detect a performance drop below a threshold voltage level, microcontroller 40 may send a signal to a purge valve controller CS4 such as a solenoid to open the purge valve 36 and discharge the impurities and other matter that may have accumulated in purge cell portion 36 (collectively referred to as "purge discharge"). The venting of hydrogen by the purge valve 70 during a purge is preferably limited (e.g., to less than 1 liter/minute on a continuous basis) ("average hydrogen discharge rate") to prevent the ambient environment monitoring and control systems, discussed below, from triggering a failure or fault. The fuel cell monitoring and control system 14 includes sensors for monitoring fuel cell system 10 surroundings and actuators for controlling fuel cell system 10 accordingly. For example, a hydrogen concentration sensor S5 (shown in FIG. 3) for monitoring the hydrogen concentration level in the ambient atmosphere surrounding fuel cell stack 12. Additionally, microcontroller 40 receives the various sensor measurements such as fuel pressure, hydrogen concentration, air mass flow, and voltage across the purge cell portion of the fuel cell stack from various sensors. Microcontroller 40 provides the control signals to the various actuators, such as air compressor controller CS1 and purge valve controller CS4. See column 7, lines 22-67, column 8, lines 1-38, and column 9, lines 9-35.

Applicant states that "Claims 1 and 4 are rejected as obvious over deVaal. In the middle of page 5 of the Office Action dated December 20, 2007, the allegation that

sensing concentration is the same as sensing the direction of flow is totally incorrect and unsupported by column 9, lines 9-15, or any other part of de Vaal. deVaal does not disclose sensing the direction of flow of gas from the fuel flow fields toward ambient. The allegation of obviousness is not supported by any facts of record and not supported by common knowledge." Applicant challenges this assertion as improper Official Notice as being not properly based on common knowledge. Applicant demands the Examiner support the assertion with adequate documentary evidence as is required in 37 CFR 104 (d) (2); In Re Zur00, 258 F.2d 1379, 1386, 59 USPQ 2nd 1693, 1697 (Fed. Cir. 2001); MPEP 21 44.03C.

This argument is also not persuasive. In order for hydrogen to be sensed in the ambient, hydrogen must flow through the exhaust. Therefore, flow to the ambient is measured using hydrogen concentration found in the ambient exhaust.

Finally, Applicant asserts that "Claim 3 is patentable as depending from claim 2; claim 2 is patentable because de Vaal does not disclose sensing the direction of flow between the flow fields and ambient and de Veal does not disclose disconnecting the electrical load if there is no flow, as is admitted at the bottom of page 5 of the Office Action dated December 20, 2007."

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.,* 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). As noted in the rejection, deVaal et al. does disclose sensing the direction of

flow between the flow fields and ambient and disconnecting the electrical load if there is no flow. Thus, the primary reference teaches the claim limitation.

Conclusion

8. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Karie O'Neill whose telephone number is (571)272-8614. The examiner can normally be reached on Monday through Friday from 8am to 5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on (571) 272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Karie O'Neill
Examiner
Art Unit 1795

KAO

/Mark Ruthkosky/

Primary Examiner, Art Unit 1795